



## Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact [support@jstor.org](mailto:support@jstor.org).

**VESPINÆ OF THE UNITED STATES AND CANADA.**

BY H. W. LEWIS, B. S.

In the preparation of this paper I have followed the classification of M. de Saussure in his "Synopsis of the American Wasps," 1875, which has also been adopted by Dalla Torre in his "Catalogus Hymenopterorum," 1894. Both of these gentlemen regarded this group of insects of subfamily value, while Mr. Cresson, in his "Synopsis of the Hymenoptera of America, North of Mexico," considered it of family rank.

I take this opportunity of expressing my thanks to Prof. Fernald, in whose laboratory, and under whose direction, this paper was prepared during my senior year at the Massachusetts Agricultural College; and also to Messrs. Cresson, Skinner and Fox for their advice and assistance while studying the Vespinae in the collection of the American Entomological Society. I also wish to thank Prof. Lintner for the loan of his entire collection of these insects for study; Mr. Henshaw, for the opportunity of examining the collection in the Museum of Comparative Zoology; and Mrs. Fernald, for valuable assistance in translating.

The species found in this subfamily are common to nearly every part of the world, and are very numerous in individuals, especially in the warmer climates. The Vespinae of the world are divided into nineteen genera, but so far as is now known only three of these — *Vespa*, *Polistes* and *Polybia* are found in our territory.

**GENERAL HABITS.**

The Vespinae are social insects, having three forms of individuals in a colony—males, females and workers. They are natural paper makers, manufacturing their paper from small fibres which they detach, by means of their strong mandibles, from the surface of wood exposed to the weather. They mix these fibres with a fluid substance from their mouths and work them into thin sheets to form the cells and coverings of their nests. The paper made in this way is quite tough and weather proof. The inner cells are hexagonal, while those near the outer edge are more or less circular. The num-

ber of cells in a nest varies with the size of the colony, and they are so arranged that the open end is generally downward. The nests of *Polistes* and *Polybia* contain but one layer of cells, while those of *Vespa* may have several layers, one above the other, with a narrow space between them. The nests of *Vespa* and *Polybia* have the cells surrounded more or less completely by a paper covering, while the cells of *Polistes* are not enclosed. The nests are all made by a single colony in one season and all but the fertilized females perish. Late in the Fall, after all the flowers are gone, if there are any larvæ or partly grown wasps in the nest, it is said that they are stung to death by the workers, who seem to realize that they would die from the cold and starvation if this was not done.

At the approach of Winter the fertilized females crawl into some sheltered place and remain in a dormant state till the warm weather in the Spring awakens them from their sleep. They at once construct a nest with ten or more cells, lay an egg in each, and when the larvæ hatch they feed and care for them until they transform into perfect insects. This first brood consists of workers only, and these at once take up the task of enlarging the nest and caring for the larvæ; for after this first brood has developed the female does nothing but lay eggs. In the care of the young and the preparation of their nests, the wasps very closely resemble the honey bee in its habits. The workers are undeveloped females produced, according to some authorities, by the amount and quality of the food given to the larvæ. Later in the season the females lay eggs which develop into perfect males and females; these mate, the males and workers die, and the females hibernate through the Winter.

Dalla Torre gives a complete synonymy of all the species of this family in his "Catalogus Hymenopterorum," vol. ix, and I have therefore omitted all synonymy from this paper.

#### GENERAL CHARACTERS OF THE VESPINÆ.

The Vespinae are easily determined by having the wings folded longitudinally when at rest, the prothorax prolonged backward to the base of the wings, eyes reniform, and intermediate tibiæ with two apical spurs. The males have thirteen segments in the antennæ and seven in the abdomen, while the females have only twelve segments in the antennæ and six in the abdomen. The workers resemble the females, but are generally much smaller.



10. Male, female and worker with scutellum, postscutellum and metathorax each having two yellow spots ..... **occidentalis.**  
 Male, female and worker with scutellum and postscutellum only having two yellow spots ..... **infernalis.**  
 Male, female and worker with scutellum only having two yellow spots. . . 12.
11. The yellow in sinus of eyes connected, or nearly connected with the frontal spot. . . . . **germanica.**  
 The yellow in sinus of eyes not connected with the frontal spot. **vulgaris.**
12. Second abdominal segment bearing only a narrow, apical, yellow border. **vidua.**  
 Second abdominal segment bearing a wide, apical, yellow band, with a deep median black notch, from which two lateral black teeth arise. **infernalis.**
13. First abdominal segment entirely dark yellow or brownish. . . . **carolina.**  
 First abdominal segment not dark yellow or brownish . . . . . 14.
14. Tibiæ and tarsi bright red . . . . . **macfarlandi.**  
 Tibiæ and tarsi not bright red. . . . . 15.
15. Posterior margin of second cubital cell equal to third. . . . . **cuneata.**  
 Posterior margin of second cubital cell twice the length of the third. **sulphurea.**

*Vespa serripes* Fab., *V. squamosa* Drury and *V. tibialis* Oliv., are unknown to me, and the descriptions of them are so incomplete that I cannot place them in the table. I am in receipt of a letter from M. de Saussure in which he writes that *Vespa communis* Sauss. is the same as *V. vulgaris*, and *V. pennsylvanica* Sauss. is the same as *V. germanica*, and I have therefore omitted these names as belonging to the synonymy.

#### DESCRIPTION OF THE SPECIES.

**Vespa crabro** Linn. ♀.—Eyes remote from the mandibles. Head ferruginous brown, large, convex, longer than broad, with the tips and inner sides of mandibles, a stripe between the antennæ and a spot above the base of each black; clypeus amber-yellow; antennæ brown, with the first three joints brown ferruginous. Thorax dark brown, with nearly the whole surface of the prothorax above, the tegulæ, and generally the scutellum and a stripe on the postscutellum, ferruginous brown. Abdomen with the first segment dark brown, an irregular stripe on the anterior border not reaching the sides ferruginous brown, and a narrow stripe on the posterior border dull yellow; second segment dark brown, with a broad, apical, yellow border deeply indented medially, and with a small, rounded indentation on each side; the remaining segments are yellow, with lateral brown indentations. Legs ferruginous brown, with the coxæ, trochanters and base of femora, except a ferruginous spot on the coxæ and trochanters, dark brown or black. Wings amber, with the nervures brown. Length 22 mm.

♂.—Like female, except the second abdominal segment, which has a much narrower yellow border with a shallow median indentation. Length 18-20 mm.

*Worker*.—Differs from female only in being smaller. Length 18-20 mm.

*Hab*.—Europe, New York (Angus), Maryland (Saussure in litt.).

**V. media** Retz. ♀.—Eyes remote from the mandibles. Head reddish yellow, with the tips of the mandibles, the region of the ocelli and about the base of the mandibles, dark brown or black; antennæ black above, except the first two joints of the flagellum, which are ferruginous, beneath ferruginous, with the scape reddish yellow in front. Thorax black, with the prothorax, tegulæ, two indistinct longitudinal stripes on the mesothorax, the scutellum and postscutellum brown. Abdomen black, with the apical border of the first and second segments reddish yellow, notched medially and the latter with a notch on each side; third, fourth and fifth segments broadly bordered with reddish yellow, with a median notch and black spot on each side; anal segment entirely yellow. Legs reddish brown, except the middle and hind coxæ, the hinder part of the fore coxæ and the base of the femora which are black. Wings reddish. Length 15 mm.

♂.—Clypeus yellow, spotted with black; antennæ as in the female; scutellum black, bearing two yellow marks. Abdomen above with the base of all the segments black and the posterior borders yellow; underside of the abdomen similar to the upper, except the first segment, which is entirely black. Length 13 mm.

*Worker*.—Head black, with the mandibles, except the edges, clypeus except a spot in the middle, a subquadrate spot on the front, sinus of the eyes with a line extending to the clypeus, an irregular stripe behind the eyes yellow; antennæ as in the female. Thorax black, with the posterior edge of the prothorax and a line extending down on each side, a stripe on each side of the scutellum and one on each side of the postscutellum yellow. Abdomen black, with the segments bordered terminally with yellow; all the borders notched medially, and all but the first with an excavation on each side. Legs as in the female. Length 13 mm.

*Hab*.—Europe, Canada, Vancouver Island (Taylor).

**V. fernaldi** n. sp. ♀.—Eyes remote from the mandibles. Head black, with the mandibles except the edges, the clypeus, except the edge and a vertical spot in the center, a subquadrate spot on the front, the sinus of the eyes and a partially interrupted stripe behind the eyes yellow; antennæ black, with the scape yellow in front; flagellum ferruginous beneath. Thorax black, with the posterior border of the prothorax, a short line extending down each side, borders of the tegulæ, a large triangular spot under the wings, a linear spot on each side of the scutellum and postscutellum and two spots on the posterior part of the metathorax yellow. Abdomen black, with the first segment broadly bordered apically with yellow, narrowing laterally and broadly indented or interrupted medially; the remaining segments broadly bordered apically with yellow, deeply indented medially and with a large black dot on each side. Legs yellow with the coxæ, except a spot on the front, trochanters, base of femora and a spot on the anterior tibiæ black. Wings hyaline with the nervures brown.

*Worker*.—Smaller than the female, which it closely resembles; sometimes the lateral dots of the abdominal segments become lateral, rounded indentations. Length 13 mm.

Var. A.—Some specimens have the first abdominal segment yellow with a median and two lateral black indentations.

Var. B.—One specimen has two small, yellow spots on the mesothorax near the scutellum.

*Hab*.—Colorado.

**V. diabolica** Sauss. ♀.—Eyes remote from the mandibles. Head black, with the mandibles except the edges, the clypeus except a variable spot in the

center, a subquadrate mark on the front, sinus of the eyes and a line from it to the clypeus, and a stripe behind the eyes yellow; antennæ black, with the scape yellow in front; flagellum ferruginous beneath. Thorax black, with an interrupted yellow line on the posterior border of the prothorax and a short one extending from it down the anterior border, borders of the tegulæ, a spot under the wings and two spots on the scutellum and postscutellum yellow. Abdomen black, the first segment with a narrow, apical, yellow border, narrowly interrupted medially; the remaining segments with a wide, apical, yellow border, strongly indented medially and notched laterally; in many cases these notches become black spots in the yellow. Legs yellow with the coxæ, except a small spot, trochanters and femora except tips, black. Wings hyaline, with the nervures brown. Length 12.5 mm.

♂.—Same as the female, except the abdomen, the markings of which vary greatly; some have the apical yellow borders of all except the first segment tridentate, others have the lateral indentations changed to spots; between these two extremes there is every gradation.

*Worker*.—Much smaller than the female; the yellow borders of all but the first abdominal segment are narrower and tridentate. Length 10 mm.

Var. A.—No line on the anterior border of the prothorax.

Var. B.—No line on the anterior border of the prothorax and scutellum only bearing two spots.

*Hab.*—United States, Canada.

I am inclined to believe that this species is *V. arenaria* Fab., but the description of Fabricius is so incomplete that I do not feel positive.

***V. borealis*** Kirby ♀.—Eyes remote from the mandibles. Head black, with the mandibles except teeth, the clypeus except the outer edges and a variable mark in the center, a subquadrate spot on the front, a narrow line from the sinus of the eyes to the clypeus and a more or less interrupted stripe behind the eyes white; antennæ black, with the scape white in front; body black and white, covered with black and gray hairs. Thorax black, with the posterior border of the prothorax and a short line extending from it down the anterior border, a triangular spot under the wings, two spots on the scutellum and two on the postscutellum white. Abdomen black, sometimes with a very fine white line on the posterior border of the first segment; second abdominal segment with a narrow, apical, white border, interrupted in the middle and slightly broadened laterally; third, fourth and fifth segments with a broad, apical, white border deeply indented or interrupted medially, the third segment with a rounded indentation on each side, which, in the fourth and fifth segments, become dots; anal segment with a white spot on each side. Legs black, with the tarsi, inside of tibiæ and femora, and a spot on the front of the two anterior coxæ white.

♂.—Similar to the female, except the abdomen, which has all the segments bordered apically with white, the first straight, indented or interrupted medially, the others more or less strongly tridentate; sometimes the spots on the postscutellum are absent or very small.

*Hab.*—United States, New York, Mt. Washington, British Columbia; Amherst, Mass.

**V. maculata** Linn. ♀.—Eyes remote from the mandibles. Head black, with the mandibles except the edges, the clypeus except the front edge and a vertical line through the middle, a subquadrate mark on the middle of the front, sinus of the eyes and a broad stripe behind each eye white; antennæ black, with the scape yellow in front, the flagellum ferruginous beneath. Thorax black, with nearly the whole prothorax above, a nearly triangular spot under the wings and a transverse mark on each side of the scutellum and postscutellum white; tegulæ ferruginous with a white spot. Abdomen black, with a white spot on each side of the third and last segments; the fourth and fifth segments have each a broad, white terminal band, more or less completely divided in the middle with a black spot on each side sometimes connected with the black on the front of the segment; the third, fourth and fifth segments have on the underside a white spot on each side slightly notched with black above; anal segment white, with a small black notch on the posterior end. Legs variegated with black and white, the last color dominant on the anterior ones and the black on the posterior ones. Wings somewhat reddish brown, especially along the costa. Length 22 mm.

♂.—Similar to the female; the white of the prothorax is restricted to a stripe on the posterior edge and a short line extending from it down the anterior border on each side; the sixth and seventh abdominal segments are the same as the fifth of the female.

Var. A.—One specimen has an irregular white line on the middle of the posterior border of the first abdominal segment, and on the third segment there are two lateral spots, narrow within and broadening near the edge.

Var. B.—One specimen has no marks on either scutellum.

*Worker*.—Similar to the female. Length 17–18 mm.

Var. A.—In some specimens the marks on the postscutellum are wanting.

Var. B.—There is no white on either scutellum or on the third abdominal segment.

*Hab*.—Europe, New York (Lintner), Maine (Fernald), Ottawa (Couper), Vancouver Island (Taylor).

**V. marginata** Kirby ♀.—Eyes remote from the mandibles. Head black, with the mandibles except the tips, a bilobed spot on the front, a narrow line extending from the clypeus to the sinus of the eyes, and a spot above and behind each eye white; clypeus whitish yellow with a large discoidal black spot in the center; antennæ black, with the scape yellow in front. Thorax black, with a white stripe on the posterior border of the prothorax, sometimes with two small spots on the scutellum and postscutellum. Abdomen black, with each segment, except the last, bearing an apical white border, and all but the first with three slight indentations; anal segment with a white spot on each side. Legs yellowish white, with the coxæ, trochanters and basal half of the femora, black.

♂.—Differs from the female in having a stripe behind the eyes more or less interrupted in the middle, a triangular spot under the wings, two small spots on the scutellum and two on the postscutellum white.

Var. A.—One specimen from Maine is yellowish white instead of white, but the nature of the markings is such that I am confident it belongs to this species.

*Hab*.—New York (Kirby), Orono, Maine, Canada, British Columbia.



**V. consobrina** Sauss. (*V. scelestus* Mac F., Trans. Am. Ent. Soc. vol. xv, p. 298) ♀.—Eyes extending to the base of the mandibles. Head black, subtriangular, slightly longer than broad, with the mandibles except the edges, the clypeus except a central trefoil-shaped black spot, a stripe behind each eye, a narrow line in the sinus of the eyes, and a bilobed spot between the antennæ white; antennæ all black. Thorax black, with a line on the posterior edge of the prothorax widely interrupted in front, two lateral spots on the scutellum, border of the tegulæ and a spot under each fore wing white. Abdomen black, the first segment entirely so; second segment with a narrow, interrupted, white border, becoming wider laterally; third segment broadly bordered apically with white and having three indentations; fourth and fifth segments very broadly bordered with white and having two rounded lateral indentations or spots; anal segment with a small white spot on each side; coxæ, trochanters, femora, except tips, black; tips of femora, tibiæ and tarsi, honey-yellow. Wings hyaline, with the nervures brown.

♂.—The abdominal segments narrowly bordered with white, the border of the first segment being narrow and interrupted.

*Worker*.—Resembles the female; the first abdominal segment has a narrow interrupted border of white, the other segments being more narrowly bordered than in the female and the indentations not so prominent. Length 10.5 mm.

Var. A.—One specimen has a narrow white line on the scape of the antennæ and a black spot on the mandibles.

Var. B.—One specimen has a small white spot on the scape of the antennæ.

*Hab*.—Maine, New Hampshire, Massachusetts, Connecticut, Pennsylvania, Virginia, Colorado, Montana, Washington (MacFarland), Newfoundland.

**V. rufa** Linn. ♀.—Eyes extending nearly to the base of the mandibles. Head black, with the mandibles, except the teeth, the clypeus, except the edges, and a vertical stripe in the middle with lateral teeth at the lower end, and a subquadrate spot on the front, a line extending downward from the sinus of the eyes and an interrupted stripe behind the eyes yellow; antennæ all black. Thorax black, with the posterior border of the prothorax, borders of the tegulæ, a spot under the fore wings, two spots on the scutellum and two smaller ones on the postscutellum yellow. Abdomen black, the first segment with a central black spot in front and a yellowish terminal border; second segment brown, with a yellowish terminal border, a black basal border connected with a black median spot extending into the brown, on each side of which is a small black spot; third, fourth and fifth segments with a broad apical band broadly notched medially and with a black spot on each side; anal segment with a large brown spot on each side. Legs yellow, with the coxæ, trochanters and basal half of the femora black. Wings hyaline, with the nervures brown. Length 15 mm.

*Worker*.—Similar to the female, except that it is smaller in size, and has the terminal borders of the abdominal segments narrower. Length 12 mm.

*Hab*.—Europe, Canada.

**V. vulgaris** Linn. ♀.—Eyes extending nearly to the base of the mandibles. Head black, with the mandibles, except teeth, clypeus, except a variable spot in the center, sinus of the eyes and a line from it to the clypeus, a quadrate

spot on the front and a band behind the eyes sometimes interrupted, and sometimes joining above with the yellow in the sinus of the eyes yellow; antennæ all black. Thorax black, with the posterior border of the prothorax, tegulæ, a triangular spot under the wings, two linear spots on the scutellum and two on the postscutellum yellow. Abdomen black, the first segment with a terminal yellow border notched in the middle. In some specimens there is a yellow line interrupted medially on the anterior border of the first abdominal segment; this line is often enlarged laterally and joined more or less with the terminal yellow border, having a lozenge-shaped spot on the middle of the segment; the remaining segments are broadly bordered terminally with yellow, notched more or less in the middle and with a black spot on each side. Legs yellow, with the coxæ, except a spot on the front, the trochanters and base of femora black. Wings hyaline, with the nervures ferruginous. Length 14 mm.

♂.—Antennæ black, with the scape yellow in front; clypeus yellow with a black spot, or entirely yellow; the yellow borders of the abdominal segments are narrow, slightly tridentate or almost regular; metathorax black. Length 13 mm.

*Worker*.—Much smaller than the female, and with the terminal yellow borders of the abdominal segments, after the first, much narrower than in the female and tridentate. Length 10 mm.

Var. A.—Some specimens have two spots on the hinder part of the prothorax.

*Hab*.—Europe; Connecticut; Amherst, Mass.

It is very difficult to separate this species from *V. germanica* Sauss. as both are very variable and run into each other to such an extent as to be quite perplexing.

**V. germanica** Fab. ♀.—Eyes extending nearly to the base of the mandibles. Head black, with the mandibles, except the teeth, the clypeus, except the lower margin, and a variable mark in the center, a subquadrate mark on the front generally connected with the yellow in the sinus of the eyes and a band behind the eyes yellow; antennæ all black. Thorax black, with the posterior border of the prothorax, borders of the tegulæ, a triangular spot under the wings and two spots on each scutellum yellow. Abdomen marked as in *V. vulgaris*. Legs yellow, with the coxæ, except a yellow spot in front, the trochanters and base of femora black. Wings ferruginous, with the nervures brown; of the same size as *V. vulgaris*.

♂.—Similar to the worker.

*Worker*.—Similar to the female, except that the apical yellow borders are much narrower and tridentate.

*Hab*.—Europe; North America; Ottawa (Couper).

**V. occidentalis** Cress. ♀.—Eyes extending nearly to the base of the mandibles. Head black, with the mandibles, except the teeth, the clypeus, except a variable spot in the center, a frontal spot, sinus of the eyes, a broad stripe behind the eyes connected above the sinus yellow; antennæ black, with the scape yellow in front. Thorax black, with a narrow yellow line on the posterior border of the prothorax widening toward the wings, the tegulæ, except a brown spot in the center, a triangular spot under the wings, two spots on the scutellum and two on the postscutellum, and sometimes on the metathorax, and generally two small spots on the mesothorax posteriorly yellow. Abdomen black, the first segment

with a broad yellow border which has a median triangular indentation, the point of which nearly interrupts the posterior border and with a black notch on each side anteriorly; second, third, fourth and fifth segments with a broad, apical, yellow border having a black spot on each side and a median triangular indentation; anal segment with a large yellow spot on each side. Legs yellow, with the coxæ, except a yellow spot on the front, the trochanters and basal half of femora, black. Wings slightly ferruginous, with the nervures brown. Length 18 mm.

♂.—Similar to the worker. Length 12 mm.

*Worker*.—Differs from the female in being smaller and in having the second, third, fourth and fifth abdominal segments not so broadly bordered with yellow, and the lateral black spots become indentations. Length 12 mm.

*Hab*.—Colorado, Nevada (Yarrow), New Mexico (Henshaw).

**V. infernalis** Sauss. ♀.—Larger than the worker, from which it differs by the following characters: A single linear spot behind the upper part of each eye; the first abdominal segment with two spots on the anterior border and a narrow band on the posterior border yellow; the remaining segments as in the worker.

Var. A.—All the abdominal segments have a narrow apical border and two yellow spots.

Var. B.—One specimen has two spots on the postscutellum.

*Worker*.—Eyes extending nearly to the base of the mandibles. Head black, with the mandibles, except the tips, the clypeus, except a variable mark in the center, a subquadrate mark on the front, a mark in the sinus of the eyes prolonged to the clypeus, and a stripe behind the eyes yellow; antennæ black, with the scape yellow in front. Thorax black, with the posterior border of the prothorax, a large triangular spot under the wings, two spots on the scutellum and two on the postscutellum very small, sometimes wanting, yellow. Abdomen black, the first segment with a broad, yellow border, which has a black dot on each side and an elongated triangular mark interrupting the anterior border medially; the second segment bears a broad, apical, yellow band with a deep, median, black notch, from which two lateral teeth arise; the remaining segments are broadly bordered apically with yellow, indented medially and bear two lateral spots; anal segment with a large yellow spot on each side. Legs yellow, with the coxæ, trochanters and basal half of the femora black. Wings hyaline, with the nervures brown. Length 14 mm.

*Hab*.—North America.

**V. vidua** Sauss. ♀.—Eyes extending nearly to the base of the mandibles. Head black, with the mandibles, except the teeth, the clypeus, except the edges, and three black spots in the center, a subquadrate spot on the front, a mark in the sinus of the eyes prolonged to the clypeus, and an interrupted stripe behind the eyes yellow; antennæ black, with the scape yellow in front. Thorax black, with the posterior border of the prothorax, border of the tegulæ, a triangular spot under each fore wing, and two spots on the scutellum yellow. Abdomen black, the first segment with two linear spots on the anterior and a narrow, straight line on the posterior border; the second segment with a narrow apical border, slightly broadened laterally; third segment with a wider, apical, yellow border, which has a broad, central, black notch, from which two lateral black teeth arise, on the fourth and fifth segments these teeth become black spots in

the yellow; anal segment with a large yellow spot on each side. Legs ferruginous yellow, with the coxæ, trochanters and basal half of the femora, black. Wings hyaline, with the nervures brown. Length 21 mm.

♂.—Similar to the female; the third abdominal segment broadly and irregularly notched in the middle; the fourth, fifth and sixth segments each bearing two lateral black spots; the rest as in the female.

*Worker*.—Similar to the female, though smaller in size. Length 18 mm.

*Hab*.—United States; Carolina; Amherst, Mass.

**V. sulphurea** Sauss. ♀.—Eyes extending nearly to the base of the mandibles. Head almost entirely sulphur-yellow, the usual subquadrate frontal spot of yellow rests on the black front and sends a prolongation up to the median ocellus; antennæ black, with the scape yellow in front. Thorax black, with the prothorax very broadly bordered with yellow; an oblique line below the tegulæ followed by two spots placed in an oblique line below the hind wing, two longitudinal stripes on the mesothorax, two spots narrowed inwardly on the scutellum, a stripe on the front edge of the postscutellum nearly divided medially, two large spots on the back part of the metathorax yellow. Abdomen black, with the same yellow marks as in *V. rufa*, but so developed as to leave almost no black space; this color forms in the yellow the following designs: Two points on the anterior face of the first segment and an irregular transverse mark on its superior face, a trilobed spot on the middle of the second, two lateral spots on each of the following segments and a longitudinal line on the anal segment; the base of the second segment is also black. Legs all yellow, except the hinder part of the hind and middle coxæ, and basal half of the femora. Wings a little smoky, washed with ferruginous; posterior border of the second submarginal cell twice as long as that of the third. Length 16 mm.

*Hab*.—California, Texas, Nevada.

The markings of this species resemble very much those of *V. carolina*, but this is of very much lighter color, being sulphur-yellow, not reddish yellow. The venation of the wings is very different, for *V. carolina* has the posterior border of the second submarginal cell equal to that of the third.

**V. cuneata** Fab. ♀.—Eyes extending nearly to the base of the mandibles. Head black, with the mandibles, except the teeth, the clypeus, except a vertical stripe, a subquadrate spot on the front, a large mark in the sinus of the eyes prolonged to the clypeus, and a band above and behind the eyes yellow; antennæ black, with the scape yellow in front. Thorax black, with the posterior border of the prothorax, the tegulæ, two longitudinal lines on the mesothorax, two spots on the scutellum, a transverse stripe on the postscutellum, two spots on the metathorax, a band on the mesopleura and generally two small spots on the metapleura yellow. Abdomen black, the first segment with an orange-yellow line on the anterior and posterior borders connected at the sides; the second segment bearing two lines, one in the center interrupted medially and joined at the sides to one on the posterior border slightly tridentate; the remaining segments with a narrow, apical, yellow border, slightly tridentate. Legs yellow, except a small black mark on the femora of the anterior pair and the posterior side of the

femora and coxæ of the remaining pairs. Wings clear transparent, with the nervures brown; posterior margin of the second submarginal cell equal to that of the third.

♂.—Similar to the female, except that the marks of the abdomen are yellow instead of orange.

*Hab.*—United States, Texas, Mexico.

**V. carolina** Dr. ♀.—Eyes extending to the base of the mandibles. Head black, with the mandibles, the clypeus, a subtriangular mark on the front, the sinus and all the space above and behind the eyes yellow; antennæ black, with the scape yellow in front. Thorax brown, with the posterior border of the prothorax, a short narrow line extending down the anterior border, two longitudinal stripes on the mesothorax, the border of the tegulæ, the scutellum, except a narrow median line, a transverse line on the postscutellum, two very large, irregular spots on the metathorax, a broad band on the mesopleura and two spots on the metapleura yellow. Abdomen ferruginous yellow with a narrow brown line on the base of the second and following segments, each bearing a brown spot on each side. Legs entirely ferruginous yellow. Wings smoky, with the nervures brown.

*Worker.*—Similar to the female, though smaller. Length 16 mm.

*Hab.*—United States, Pennsylvania.

**V. macfarlandi** (*V. bistrata* MacF., Trans. Am. Ent. Soc. vol. xv, 1888).

♀.—Head black, with the mandibles, except a narrow margin, the clypeus, except a small, irregular, black mark, a somewhat triangular spot on the front, a spot in the sinus of the eyes confluent with a narrow orbital margin yellow; antennæ black, with the scape yellow in front. Thorax: collar yellow, giving off an anterior, pointed, descending process; sides of the thorax beneath the wings marked by an oblique yellow stripe and two yellow spots; tegulæ yellow, with a ferruginous spot; scutum with two longitudinal yellow lines; scutellum with two large yellow spots; postscutellum yellow, narrowly interrupted with black, each side bearing a superior, small, circular, yellow spot, and an inferior, large, subquadrate yellow spot. Abdomen: first segment black, with a narrow, interrupted, basal, yellow border, confluent with two lateral, basal spots and at the sides with a narrow, nearly interrupted apical yellow margin; second segment black, marked about the middle with a broad, broken yellow band, with two rounded indentations and confluent laterally with the interrupted band; the third segment yellow, notched basally with black and having two lateral black spots; the fourth segment yellow, less deeply notched with black and having two black spots; the fifth segment yellow, scarcely indented with black anteriorly and having two lateral spots; anal segment yellow, with a longitudinal black stripe. Legs yellow, the coxæ and femora marked above with black, tarsi ferruginous. Wings hyaline, with the nervures brown. Length 18 mm.

*Hab.*—North America.

I am obliged to change the name of this species as Fabricius previously described a species by this name from South America in Syst. Piez. p. 281, n. 56, 1804.

**V. squamosa** Dr. (Descr. of *V. squamosa* in Drury Ins. i, p. 98, pl. 43, fig. 7). Head yellow, region of the ocelli black and hairy; eyes black; eyes dark brown.

except the first joint, a part of which is yellow, shorter than the thorax; the thorax is yellow and a little hairy, having three black stripes on the top and two on each side that meet on the breast; the wings are thin, almost transparent and doubled or folded lengthwise together; the abdomen is of a dark orange color with a black ring near the anal segment and two lesser ones near the thorax, none of which are seen underneath, being there entirely of a dark orange color; the legs are yellow and furnished, except the fore ones, with two spines at the shin joint, these having only one.

*Hab.*—New York.

**V. serripes** Fab. (Descr. of Fab., Ent. Syst. vol. ii, p. 226, No. 46, 1793).—Of medium size. Head black, with three spots under the antennæ and two points near the eyes fulvous; antennæ black, the second and third joints rufous. Thorax black, with two points before and two behind the scutellum yellow. Abdomen black, with six yellow fasciæ, the first nearly interrupted. Feet yellow, all the tibiæ serrate spinose. Wings fuscous.

*Hab.*—North America. In the collection of Rev. Mr. Banks.

**V. tibialis** Oliv. (Descr. Oliv., Encycl. Meth. Hist. Nat. Ins. p. 690, No. 103).—Head black, with a little point on the front and two others scarcely apparent on the superior mandibles; antennæ black, with the underside of the first joint yellow; the corselet is black, with an interrupted transverse line on the anterior border and another shorter one on the scutellum yellow. Abdomen black, with the border of the first and second segments yellow. Legs yellow, with the femora black. Wings black.

*Hab.*—North America, Georgia.

#### GENERIC CHARACTERS OF THE GENUS *POLISTES*.

This genus is characterized by having the metathorax as long as broad, oblique above, with a median dorsal furrow, which is often more or less finely striated. Abdomen subsessile or subpetiolate, long, fusiform and with the basal nervure of the fore wings joining the subcostal at the base of the stigma. The species of this genus are very numerous and widely distributed. They are exceedingly variable in the form and color of their markings, and for this reason it is a very difficult genus to study. M. de Saussure has given most excellent hints on the study of these insects in the "Annales de la Societ  Entomologique de France," (3) v, 1857, p. 314, with which every student of the genus should make himself familiar.

In their general habits the species of *Polistes* closely resemble those of *Vespa*, but they differ from them simply in having their nests composed of a single layer of cells, and in not having them enveloped or surrounded by any papery covering. They build their nests mostly about houses and outbuildings.

I have not attempted to give any table for the determination of

the species, for the reason that they are so exceedingly variable and the amount of material which I had for study was so insufficient that I found it impossible. I have, therefore, done little more than to bring together the descriptions of our species, but trust that others may be encouraged to undertake the serious study of these insects. It is very desirable to secure specimens of the sexes taken from one nest and compare them critically with those of another, and with specimens of the same nest taken at different seasons of the year.

#### DESCRIPTION OF SPECIES.

**Polistes canadensis** (Linn.).—Head and thorax ferruginous brown; antennæ ferruginous at their base, black in the middle, orange at the end; a little black on the sides of the thorax and in the median dorsal furrow of the metathorax; metathorax with fine, transverse striæ. Abdomen brown or blackish; coxæ and femora black, tarsi, ends of the femora and base of the tibiæ, ferruginous. Wings deep brown, with brown reflections. Length 18 mm.

Var. A.—The femora ferruginous, black underneath; tibiæ of the middle legs ferruginous.

Var. B.—Body and legs entirely ferruginous.

Var. C.—Posterior border of the first segment of the abdomen ferruginous.

*Hab.*—Florida, Mississippi (Ashmead), Washington, D. C. (Packard), Texas.

**P. annularis** (Linn.).—Black. Head ferruginous, a line on the top of the clypeus and vertex black; antennæ ferruginous, black in the middle, orange at the end; the prothorax bordered with red; tegulæ, a point under the wings, two marks on the middle of the mesothorax, two points on the scutellum, and two on the metathorax, reddish; postscutellum ferruginous yellow. Abdomen black, the first segment bordered with yellow. Legs brown, with the articulations yellow. Wings black. Length 18 mm.

Var. A.—Thorax ferruginous, varied with black.

Var. B.—Whole insect clear ferruginous.

Var. C.—Insect brown, often confounded by the color with *P. canadensis*.

Var. D.—Thorax and two marks on the sides of the second segment reddish.

*Hab.*—North America. Very common in the cotton belt of the South (Ashmead), Brazil (Saussure).

**P. crinitus** (Felton) ♀.—Head yellow, front and vertex ferruginous; clypeus convex, rounded at the base; first joint of antennæ ferruginous the rest yellow, black above in the middle. Thorax black; prothorax angular, bordered with yellow; scutellum and postscutellum yellow, separated by a black line; tegulæ and a line or mark under the wings rejoining the angles of the prothorax yellow; metathorax smooth, with the median dorsal furrow very pronounced; articular valves yellow. Abdomen black, all the segments regularly and broadly bordered with yellow, the borders of the second and third very straight and preceded by a red band; the last two ferruginous yellow. Legs black, ends of the femora, tibiæ and tarsi yellow, outer side of the hind legs black. Wings ferruginous, washed with brown.

Var. A.—Body brown or red, instead of black; borders of the abdomen somewhat fused with the brown or black; antennæ ferruginous with black in the middle.

Var. B.—*P. crinitus billardieri* Sauss.—Posterior parts of the head yellow; orbits and ends of the clypeus yellow. Thorax red; prothorax bordered with yellow in front and behind; scutellum bordered with yellow; metathorax black, with two yellow lines; the first segment of the abdomen yellow on three sides, black in the middle, the rest reddish, narrowly bordered with yellow. Wings brownish.

Var. C.—Mesothorax black, with two small yellow lines; metathorax with two yellow lines.

Var. D.—Two yellow lines on the posterior plate of the metathorax and two on the sides.

*Hab.*—America.

**P. crinitus lineatus** Fab. *Worker*.—Head ferruginous yellow, the region of the ocelli and an irregular line under the antennæ, blackish ferruginous; antennæ ferruginous yellow, the first two joints blackish ferruginous as well as the upper part of several of the middle ones. Thorax ferruginous brown; two longitudinal lines on the mesothorax, the borders of the tegulæ and prothorax, a mark under the wings, a line on the scutellum, one on the postscutellum, and a scalloped mark bilobed at the top on each side of the metathorax, all ferruginous yellow. Abdomen ferruginous brown, with the terminal borders of the segments ferruginous yellow; this border extends forward on the side of the segments. Legs yellow, except the tips of the femora and the outer ends of the middle and hind tibiæ, which are black. Wings ferruginous brown, with violet reflections. Length 16 mm.

*Hab.*—America.

**P. aurifer** Sauss. ♀.—Black; mandibles, clypeus, orbits and a very open V-shaped mark on the front yellow; antennæ orange; the borders of the prothorax, a mark under the wings, the tegulæ, the anterior border of the scutellum and postscutellum and two lines on the metathorax yellow. Abdomen yellow, base of the first two segments black, the black excavating the yellow in the middle and sometimes forming there a design, the third occasionally black in the middle at its base. Legs black, ends of femora, tibiæ and tarsi bright yellow. Wings having a general golden tint or a ferruginous gray. Length 15 mm.

Var. A.—End of the posterior tibiæ black.

*Hab.*—California, Colorado, Australia, Honolulu.

**P. fuscatus** (Fab.).—"Fuscous, spotted with ferruginous; first segment of the abdomen with a yellow margin, second with two ferruginous spots. Length and magnitude of *P. annularis*; antennæ black, base ferruginous. Head fuscous, with the labium and mandibles ferruginous. Thorax fuscous, with a ferruginous line on each side in front. Abdomen fuscous, the first segment with a yellow margin, second with a large fulvous spot on each side. Feet variegated."

*Hab.*—America.

**P. fuscatus instabilis** Sauss. *Worker*.—Insect dark red, a little rose colored; base of the clypeus yellow; vertex around the ocelli black; antennæ black in the middle; prothorax bordered, its angles without spines; underside



of thorax and the sides of the metathorax and mesothorax entirely black; metathorax smooth, or almost smooth; orbits often yellowish; the borders of the prothorax, a large mark under the wings, anterior angles of the scutellum, post-scutellum or only its anterior border, as well as two lunate spots on the metathorax, sulphur-yellow; on each edge of the metathorax on the sides, a yellow mark often connected with the mark on the posterior plate; tegulæ often yellowish: base of the first two segments of the abdomen often black; terminal borders of the first, second and third segments yellow. Legs black, ends of the femora, tibiæ and tarsi yellow or red, posterior tibiæ black, except the base, which is yellow. Wings of a uniform gray tint. Length 14 mm.

Var. A.—Mesothorax black, with two red marks; metathorax entirely red.

Var. B.—Thorax entirely black; first segment of the abdomen reddish black, bordered with yellow, the second red, its base black, its border glaucous yellow, yellow on the edges, a little black on the front of the border, the others black; the third and fourth bordered with greenish yellow, on each edge an irregular red marginal mark; terminal segment reddish. Legs varied with red and yellow.

*Hab.*—United States, Mexico.

**P. fuscatus exilis** Sauss. ♂.—Head and thorax black; face whitish yellow; posterior orbits and the space between the eyes of the same color; mandibles sulphur-yellow, with a black dot at their base; antennæ black, ferruginous beneath, except at the end; the two edges of the prothorax bordered with sulphur-yellow or ferruginous; anterior border of the postscutellum and two lines on the metathorax sulphur-yellow, as well as the articular valves. Abdomen black, all the segments bordered with sulphur-yellow, the second bearing on each side a round point of red, and the first often two yellow points in front of the angles of the border of this segment; end of the abdomen often ferruginous. Legs ferruginous, under or posterior side of the femora black; posterior legs a little brown; front of the coxæ yellow, which color prolongs itself onto the front of the thoracic segments placed above the coxæ. Wings transparent, washed with yellow. Length 13 mm.

Var. A.—Prothorax and metathorax black; the first segment of the abdomen bordered with yellow.

*Hab.*—North America.

**P. pallipes** Lepel. ♀.—Head black, with the mandibles, the convex clypeus, except the edge, a broad stripe behind the eyes, the sinus of the eyes with a line extending to the clypeus, ferruginous; antennæ black above, ferruginous beneath. Thorax black; posterior edge of the prothorax and the tegulæ ferruginous. Abdomen black, the first segment with a pale yellow terminal border; all the coxæ, the greater part of the femora and the outer side of the tibiæ black, the rest of the legs ferruginous or dull yellow. Wings smoky brown; some specimens have a small spot under the base of the fore wings, two points sometimes extended into a line on the front of the scutellum, a similar line on the postscutellum, and sometimes a longitudinal stripe on each side of the median dorsal furrow of the metathorax yellow; occasionally specimens are found in which all the abdominal segments above and beneath have a narrow terminal border; the clypeus is sometimes black and the markings yellow instead of ferruginous; a few specimens have a ferruginous spot on each side of the second abdominal segment and occasionally traces may be found on some of the other segments. Length 21 mm.

♂.—Differs from the female in having the clypeus very flat, all the face, the breast and the coxæ beneath, yellow; the front of the femora reddish yellow; the underside of the antennæ yellow, or reddish yellow. Length 20 mm.

*Worker*.—Similar to the female, but somewhat smaller. Length 18 mm.

M. de Saussure has given the following descriptions of varieties:

Var. *Worker*.—Two yellow lines on the metathorax.

Var. A.—Border of the tegulæ indistinct, first segment of the antennæ red; postscutellum ornamented with two yellow points.

Var. B.—Abdomen black, border of the second segment unmarked, the lateral spots red.

Var. C.—Prothorax, clypeus and border of the third segment of the abdomen red.

Var. D.—A mark under the wings, two points on the scutellum yellow; metathorax with two yellow lines.

Var. E.—Marks of the abdomen large, melting with the borders which are red.

Var. F.—All the segments of the abdomen bearing a red mark on each edge.

Var. G.—All the segments red, their base black, their borders more or less embroidered with whitish yellow.

Var. H.—Mesothorax and abdomen red; no yellow on the insect; base of the second segment black.

Var. I.—Metathorax red, with two yellow lines; scutellum marked with yellow. Abdomen red.

Var. J.—Abdomen chestnut, the first segment embroidered with yellow; two yellow points on the metathorax.

Var. K.—Marks on the second segment of the abdomen white.

Var. L.—Large; abdomen ferruginous, with four quite large yellow borders; metathorax with two yellow bands; antennæ a little gray above.

*Hab*.—United States, Canada.

**P. metrica** Say.—Ferruginous. Abdomen black. Wings dark violaceous; body ferruginous; antennæ fuscous, first and second joints ferruginous beneath, last five or six joints fulvous beneath; hypostoma with a few distant, short, yellow hairs, not sericeous, at the middle of the tip a little prominent. Thorax with a black dorsal line abbreviated behind, each side of which is an obsolete line confluent behind, exterior to which at the base is a black line attenuated before and abbreviated. Wings dark violaceous. Feet black, tibiæ within, except posterior pair, knees and tarsi yellowish. Abdomen black, first segment absolutely piceous each side and on the posterior edge, second segment also with obscure ferruginous on each side, sometimes obsolete. Length over four-fifths of an inch.

*Hab*.—United States.

**P. minor** Beauv.—*Worker*.—Insect ferruginous; clypeus yellow, with a ferruginous mark; mandibles yellow; orbits broadly bordered with yellow; antennæ black above at the middle, nearly to the end; the borders of the prothorax, tegulæ, and a point under the wings, the anterior border of the scutellum, the postscutellum and two large marks, which cover the posterior plate of the metathorax, yellow. Abdomen short, oval, depressed, the first segment broadly bordered with yellow, this border bearing a large, square, or tricuspid indentation; the three following segments ornamented at the borders with little festoons, the

rest of the abdomen ferruginous. Legs ferruginous, knees, tibiæ and tarsi, yellow; the posterior tibiæ ferruginous at the end. Wings ferruginous, brown in the radial; third cubital cell regularly lozenge shaped.

♂.—Antennæ scarcely obscure above; borders of the orbits and the yellow of the clypeus forming a yellow V on the front of the face.

*Hab.*—Georgia, Louisiana, California, Texas.

**P. rubiginosus** Lepel.—Insect entirely clear reddish yellow; a little black around the ocelli; antennæ blackish above from the fourth segment up. Thorax bearing a golden down. Wings brown, with violet and golden reflections.

Var. A.—Three black lines on the mesothorax, one on the metathorax. Length 18 mm.

*Hab.*—Pennsylvania, Illinois, Georgia, Missouri (Murtfeldt), Texas.

**P. perplexus** Cress. ♂.—Ferruginous, strongly golden sericeous; face and clypeus flat, dull yellow-white, pale on orbits and above insertion of antennæ; mandibles and cheeks beneath more or less dull yellowish white; antennæ ferruginous, paler at base beneath, joints above more or less black, especially those at the apex; collar more or less black; prothorax generally more or less margined with pale yellow; mesothorax black, with two central, longitudinal, more or less distinct ferruginous lines; scutellum sometimes divided centrally by a black line; metathorax with a broad, deep, longitudinal groove, finely and transversely striated, ferruginous, generally with three longitudinal black lines, which are sometimes subobsolete; sometimes the metathorax is entirely ferruginous, except the groove, which is always black, sometimes entirely black, except a spot on the flanks and a stripe on each side of the groove; pleura generally yellowish beneath, more or less black laterally. Abdomen of different shades of ferruginous, strongly golden sericeous, the three basal segments have frequently a more or less distinct, narrow yellow apical margin; the base of the second, third and fourth segments is more or less broadly black, sometimes obsoletely so, sometimes only the second or third, or fourth is so marked; ventral segments more or less marked with black at the base, the intermediate segments sometimes banded with yellow. Legs ferruginous, the four anterior coxæ; femora and tibiæ beneath more or less pale yellowish, all the coxæ more or less black above. Wings fuscous, darker along the costa and in the marginal cell; second and third submarginal with subhyaline streaks. Length 18-21 mm.

*Hab.*—Texas, Bermuda.

**P. generosus** Cress. ♂.—Head subsericeous, face long, dull luteous; anterior orbits, a band above the antennæ filling up the emargination of the eyes, and mandibles, yellowish white or luteous; venter and occiput black; cheeks and a dot on each side behind the ocelli, ferruginous; clypeus longer than wide, flat, sparsely and finely punctured, apex angular; ridge between the antennæ sub-tuberculate above; antennæ long, black above, fulvous beneath, scape yellowish beneath, narrowly edged with fulvous above; prothorax fulvo-ferruginous, black laterally, upper margin narrowly edged with yellowish; mesothorax black, with two short ferruginous stripes on the anterior middle; scutellum black, with two ferruginous spots; postscutellum ferruginous, narrowly margined with black; metathorax transversely and rather coarsely wrinkled above, with a broad, shallow groove down the middle, a slender stripe on each side of the groove and a spot

on each flank ferruginous; pleura black; a ferruginous spot beneath the tegulæ and a luteous subangular mark behind the anterior coxæ; tegulæ ferruginous, fuscous at the base. Legs fulvous, yellowish beneath, sericeous; the four anterior coxæ above, posterior pair entirely, and all the femora above, black. Abdomen subsericeous, fulvo-ferruginous, a longitudinal mark on the basal middle of the first segment; basal margin of second segment dilated above and suddenly dilated laterally; the narrow basal margin of the third and fourth segments black; apex of the second and following segments stained more or less with fuscous; apical segment blackish, rugulose; venter black. Length 22 mm.

*Hab.*—Texas.

**P. texanus** Cress. ♀.—Dull ferruginous, sericeous. Head yellow; vertex, occiput and posterior margin of the cheeks ferruginous; clypeus subconvex, sparsely punctured, sometimes tinged with fulvous at the base; antennæ entirely fulvo-ferruginous; narrow margins of the prothorax, sometimes a band at the base of the scutellum, postscutellum more or less, two stripes on the disc of the metathorax, a spot or stripe on each side, a spot beneath the tegulæ, a spot beneath the posterior wing and the tegulæ more or less yellow; metathorax with a shallow median groove, transversely striated; sometimes the mesothorax has two short discal lines. Abdomen strongly pale golden sericeous, rather broad apical margin of all the segments, except the last, even on the first segment and more or less strongly sinuate anteriorly on the remaining segments, an angular mark on each side of the first segment sometimes reduced to a dot, and a spot on each side of the remaining segments, larger on second and sometimes nearly confluent with the apical band, all yellow; all the apical bands slightly interrupted or indented medially by a slender ferruginous line; venter ferruginous, more or less varied with yellowish; sometimes the yellowish markings on the second and following segments are more or less obscure; anterior coxæ beneath, a line on the outside of the four posterior coxæ, four anterior femora beneath except base, tips of all the femora and outside of all the tibiæ and base of tarsi more or less yellowish, tips of tarsi fuscous. Wings yellowish fuscous, darker along the costa. Length 21 mm.

♂.—Closely resembles the female; the face flat as usual, whitish yellow, this color extending above the antennæ and on a line with the emargination of the eyes; clypeus flat; prothorax sometimes broadly yellowish laterally; mesothorax occasionally with two short discal yellow lines; the markings of the abdomen vary considerably, being sometimes very distinct with the apical bands broad and lemon-yellow and the lateral spots round and whitish; sometimes the apical bands are narrow and the lateral spots wanting, except on the second segment; sometimes the first segment has no lateral spot.

*Hab.*—Texas.

**P. bellicosus** Cress. ♂ ♀.—Uniformly dull ferruginous, subsericeous.

♀.—Clypeus, sides of face, a transverse line above the antennæ, posterior orbits broader beneath and the mandibles yellow; clypeus subconvex and sparsely punctured; tegulæ, a line on the outer side of all the coxæ, knees and four anterior tibiæ and tarsi beneath, the narrow apical margin of the abdominal segments more or less sinuate anteriorly, and sometimes a spot on each side of the first and second segments, all lemon-yellow; mesothorax generally with a fine central longitudinal black line; metathorax finely and transversely wrinkled. Wings fuscous, or fusco-hyaline, yellowish along costa, subviolaceous.

♂.—Clypeus, face as far up and on a line with the emargination of the eyes, narrow posterior orbits broader beneath, and mandibles yellow; clypeus flat; antennæ long, pale beneath, dark above, scape yellowish beneath; margins of prothorax, basal margin of scutellum, postscutellum, two longitudinal lines on disc of metathorax, sometimes a lateral spot beneath tegulæ, space between four anterior coxæ, coxæ beneath all lemon-yellow. Length 18 mm.

*Hab.*—Georgia, Florida, Mississippi, Texas.

**P. variatus** Cress. ♀.—Strongly sericeous, black; a transverse, subangular line above antennæ; posterior orbits broader beneath, and mandibles, except tips, yellow; clypeus subconvex, sparsely punctured, ferruginous, more or less broadly yellow at apex; cheeks sometimes ferruginous; antennæ ferruginous, black above; prothorax ferruginous, black on extreme lateral corner and narrowly margined anteriorly and posteriorly with yellow; mesothorax and pleura, except yellow spot beneath tegulæ, entirely black; scutellum and postscutellum ferruginous, margined at base with yellow; metathorax black, with four longitudinal yellow stripes, the lateral one sometimes slightly undulate, disc longitudinally sulcate and finely transversely wrinkled; tegulæ fulvous, margined with yellow. Abdomen strongly sericeous, fuscous or black, varied with dull ferruginous, especially on the second segment; apical margin of each segment dilated laterally and slightly interrupted medially, and an irregular spot on each side, largest on the second segment yellow; beneath ornamented much as above. Length 18 mm.

♂.—Face and clypeus flat, and yellow as far up and on a line with emargination with the eyes, cheeks beneath broadly yellow; antennæ long, yellowish beneath, apex black. Thorax without any ferruginous colors; sides of prothorax and pleura anteriorly beneath pale yellow; scutellum sometimes with only a lateral yellow dot at base; lateral stripes of metathorax sometimes wanting. Abdomen darker than in the female, sides of the second segment with a large ferruginous blotch enclosing a yellow spot; lateral margin of the first segment yellow; disc of the second, third and fourth ventral segments with a large triangular yellow mark, apical margins also yellow. Length 18 mm.

*Hab.*—Texas.

**P. navajoe** Cress. ♀.—Head pale yellow, the venter, occiput and tips of mandibles black; a yellow spot on each side confluent with the orbits; clypeus rounded and ciliated anteriorly, sparsely punctured and pubescent; cheeks tinged with fulvous; antennæ fulvo-ferruginous, the middle of flagellum black. Thorax velvety black; posterior border of the prothorax broader in front, tegulæ and scutellum ferruginous; the mesothorax has sometimes a faint stain on each side; metathorax pubescent, obliquely striated, with a deep, central, longitudinal channel. Abdomen longer than the head and thorax, sericeous, the first and second segments above and beneath, except apical margins, broader on the second segment, and the basal margin of the third segment above and beneath black; the remainder lemon-yellow; the anterior half of the apical margin of the second segment is fulvous above, shading gradually into the yellow, sometimes this margin is entirely fulvous; the third and remaining segments have a faint, central, longitudinal, fulvous streak and a lateral spot of the same color, that on the third segment sometimes very distinct. Length 18-20 mm.

*Hab.*—California, New Mexico, Arizona.

**P. flavus** Cress. ♀.—Lemon-yellow; base of clypeus, vertex and cheeks tinged more or less with fulvous; clypeus subdepressed, subquadrate, sparsely punctured, each puncture giving out a short fulvous hair, apex angular, ciliated, the lateral angles with two teeth, the inner one the longest: tips of mandibles black; space between the antennæ protuberant; antennæ entirely fulvous, darker above; prothorax faintly tinged with fulvous, its posterior margin yellow; mesothorax fulvous, the incisures and a longitudinal black line on the disc abbreviated posteriorly, black; a faint line on each side of the disc and the lateral margins yellow; metathorax with a deep, central, longitudinal channel; tegulæ with a median fulvous spot. Abdomen bright lemon-yellow, not longer than head and thorax, subsericeous, a central longitudinal streak posteriorly, a spot at the base of the first segment, a narrow line across the middle, slight stains on each side of the first and second segments at base, a transverse spot on each side near the apex of the second to fifth segments connected by a slender arcuated line (both above and beneath) fulvous; basal segment triangular, its apical breadth equal to its length. Legs faintly tinged with fulvous at base and on the tarsi. Wings varied with fuliginous, darker along the costa, a bright violaceous reflection, base of both wings, a narrow longitudinal streak through the middle of the wing, and most of the second submarginal cell subhyaline; stigma, costal vein from the stigma to the base and the nervures at the base of the wing fulvous, the rest black. Length 18 mm.

*Hab.*—New Mexico.

**P. anaheimensis** Prov. ♀.—Black with yellow spots; clypeus, mandibles, front, orbits, an angular band above the antennæ and cheeks yellow; antennæ beautifully honey-yellow without any spot. Thorax black; anterior and posterior border of the prothorax, tegulæ, spot on the sides, a line under the hind wings, the borders of the scutellum and postscutellum, and two longitudinal lines on the metathorax yellow. Abdomen sulphur-yellow: all the segments with a black band at the base; the band on the second and third segments is prolonged into a triangular point in the middle; the basal segment is black with the top yellow, and a lateral yellow spot contiguous to the apical band. Feet yellow, coxæ and two-thirds of the femora, with a spot on the inside at the end of the hind legs black. Wings smoky yellow, nervures brown.

♂.—Abdomen almost entirely yellow, having only a narrow black line at the base of the segments. Length 17-18 mm.

*Hab.*—Anaheim, California.

**P. nestor** (Fab.).—Fuscous; front yellow. Head fuscous, front and mouth widely yellow; antennæ black, ferruginous beneath. Thorax fuscous, with the anterior margin, two very fine, oblique lines on the front, and two abbreviated lines under the scutellum yellow; scutellum ferruginous. Abdomen ferruginous, a black spot at the base of each segment and the margins yellow. Feet ferruginous. Wings ferruginous; a little larger than *V. marginalis*.

*Hab.*—North America.

**P. apachus** Sauss.—“Ferruginous, much marked with yellow. Abdomen subdepressed, ovoid; segments bimaculate with sulphur-yellow; mesothorax marked with two sulphur-yellow lines. Wings ferruginous.”

*Hab.*—New Mexico and Sonora (Sauss.).

**P. carolinus** (Linn.).

Saussure, who examined the type of Linnaeus, in London, states that the species which was originally put into the genus *Vespa* is a true *Polistes*, and is as long as *V. crabro*. His description is as follows:

Front yellow. Thorax ferruginous, with three black longitudinal lines. Abdomen sessile, ferruginous; fore wings blackish, hind wings hyaline.

Saussure further states that the species resembles *P. bicolor*, of South America, more or less, but with two yellow lines on the thorax and with the antennæ brown.

*Hab.*—Carolina.

**P. comanchus** Sauss.—Moderately stout; margin of the clypeus rounded, not acute, dentate. Head ferruginous, vertex and middle of antennæ black. Thorax black, bordered in front with ferruginous. Abdomen golden-yellow, the segments margined with yellow, base of the first black.

*Hab.*—New Mexico.

GENERAL CHARACTERS OF THE GENUS *POLYBIA*.

The species of this genus have the wings folded longitudinally when at rest, the prothorax prolonged backward to the base of the wings, and two spurs at the end of the middle tibiæ. They closely resemble *Polistes* in the venation of the wings and in the form of the thorax, but differ greatly in the form of the abdomen. The first segment is slim and petiolate, and about as long as the rest of the abdomen, which is compressed and ovate. These insects are quite small, not nearly as robust as any of the species of *Polistes*.

Only two species of *Polybia* have thus far been found in the United States—*P. cubensis*, in Florida, and *P. flavitarsis*, in California. Numerous other species occur in Cuba and Mexico, and it is possible that some of these may be found in our territory.

Their nests are built on leaves of trees or in some sheltered place and consist of but one layer of cells as in *Polistes*, but they have one or more coverings to protect them from the weather.

The species of *Polybia* vary greatly in coloration, much as in *Polistes*. The two species in the United States are easily separated, *flavitarsis* being comparatively large, about 18 mm. long, and marked chiefly with light brown and yellow, occasionally with a little black, while *cubensis* is relatively small, about 10–12 mm. and marked chiefly with dark brown or black, with narrow, yellow borders.

**Polybia flavitarsis** Sauss. ♀.—Head as broad as long, orange-yellow; eyes and space between the antennæ and ocelli black; antennæ ferruginous,

brown at the tips, and orange-yellow on the front of the scape; anterior and posterior borders of the prothorax above, tegulæ, two spots under the wings, anterior border of the scutellum and postscutellum, and two marks on the metathorax orange-yellow; base of the first abdominal segment black or brown, apical end orange-yellow; the rest of the abdomen orange-yellow, or sometimes transversely striped with black; although the coloration of the abdomen is very variable, the brown predominates on the second and third segments without forming any definite designs; coxæ, trochanters and base of femora black, the rest of the legs and the spots on the coxæ and trochanters orange-yellow. Length 16-20 mm.

♂.—Very closely resembles the female.

*Worker*.—Is unknown to me.

*Hab*.—California.

**P. cubensis** Sauss. ♀.—Prothorax brown, with the posterior border and a line connected with it and extending down each side of the anterior border yellow; tegulæ yellow; scutellum brown, with the anterior border yellow; postscutellum yellow; mesothorax brown, with two light brown longitudinal marks in the center; metathorax black, with two large yellow spots; meso- and metapleura black, each bearing two yellow spots. Abdomen brown, each segment bearing a narrow, apical, yellow border; coxæ, except two yellow spots, trochanters and base of femora black; rest of the legs yellow. Wings transparent, cloudy at the tip, nervures ferruginous.

*Hab*.—Florida, West Indies.





## EXPLANATION OF PLATE I.

---

 ALL THE FIGURES MORE OR LESS ENLARGED.
 

---

Fig. 1.—Side view of *Vespa maculata*.

- |                                    |                   |
|------------------------------------|-------------------|
| a. antenna.                        | i. scutellum.     |
| b. eye.                            | j. postscutellum. |
| c. clypeus.                        | k. tegula.        |
| d. mandible.                       | l. mesopleura.    |
| e. space between eye and mandible. | m. metapleura.    |
| f. space behind eye.               | n. coxa.          |
| g. prothorax.                      | o. abdomen.       |
| h. mesothorax.                     |                   |

Fig. 2.—Top view of *Polistes pallipes* ♀.

- |                   |                        |
|-------------------|------------------------|
| a. antenna.       | k. tegula.             |
| b. eye.           | o. abdomen.            |
| g. prothorax.     | p. metathorax.         |
| h. mesothorax.    | q. petiole of abdomen. |
| i. scutellum.     | r. ocelli.             |
| j. postscutellum. | s. vertex.             |

Fig. 3.—Abdomen of *Polybia flavitarsis*.Fig. 4.—Front view of head of *V. consobrina*.

- |               |            |
|---------------|------------|
| a. antenna.   | r. ocelli. |
| b. eye.       | t. teeth.  |
| c. clypeus.   | u. front.  |
| d. mandibles. |            |

Fig. 5.—Fore wing of *Polistes pallipes*.

- |                       |                             |
|-----------------------|-----------------------------|
| a. stigma.            | d. first submarginal cell.  |
| b. costal nervure.    | e. second submarginal cell. |
| c. subcostal nervure. | f. third submarginal cell.  |

Fig. 6.—Hind wing of *Polistes pallipes*.Fig. 7.—Fore wing of *V. diabolica*. Letters as in fig. 5.Fig. 8.—Hind wing of *V. diabolica*.Fig. 9.—Antenna of *V. diabolica*.

- a. scape.
- b. flagellum.

Fig. 10.—Antenna of *V. diabolica*. Letters as in fig. 9.Fig. 11.—Middle leg of *V. diabolica*.

- |                |                  |
|----------------|------------------|
| a. coxa.       | d. tibia.        |
| b. trochanter. | e. apical spurs. |
| c. femur.      | f. tarsus.       |

Fig. 12.—Middle leg of *Polistes pallipes*. Letters as in fig. 11.

